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ABSTRACT

The main barrier to effective instructional practice is lack of information. Comprehensive information systems are evolving which will capture and present the information required for a truly effective and efficient education system. Barriers to computerized information systems are no longer technical but stem from a lag in the will, wisdom, and wherewithal to develop and use them. A lack of sustained committment by overworked school teaching and administrative staff to gathering and maintaining data for their own use or for reporting upward has been the biggest obstacle. Distributed processing and building-based computer technology is making school based data input and utilization easier and more rewarding for building staff. Data from school input can be skimmed off for higher level decision-making and educational research. While there are possible misuses of comprehensive educational information systems, their potential for revolutionizing educational decision-making about student learning and schooling operations at every level in school systems is truly exciting. (BS)

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Hopes and Possibilities for Educational Information Systems

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"When mankind has once realized that its first function is to penetrate, intellectually unify, and harness the energies which surround it, in order to still further understand and master them, there will no longer be any danger of running into an upper limit of its florescence."

- Teilhard de Chardin

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In the past, revolutions were often started with someone riding or walking up to somebody else's city, palace or church doors and shouting or nailing up certain declarations of principal and action. Recently, acting in the same spirit, I put the following messages out on the CompuServe and Telenet electronic bulletin boards which are two of the most used gateways to the electronic community:

1. We now know and have known for a long time what in theory we must do to help every child learn as much as he or she can as effectively and efficiently as possible, i.e.,

   . The student's current, most pressing learning needs vis-a-vis well planned curriculum must be identified.

   . The student must be helped to set clear, relevant, attainable learning objectives to meet those needs.

   . The student must be expected to succeed in attaining the learning objectives and must want to learn them.

   . The student must receive individualized instruction directly related to the learning objectives designed to meet his or her current learning needs.

   . The student must use the time allocated for instruction to work intently and seriously on the task of learning.

- The student must know when he or she has succeeded and when not and must experience a reinforcing sense of accomplishment and achievement as a result of knowledge of success.

- The student must receive and return a sense of caring, personal concern, interest, respect and commitment which provides the psychological support necessary to want to learn and to work to learn, and finally

- The student must receive and accept parental and community support and encouragement for success in learning.

2. The main barrier to our putting this proven theory of effective instruction into practice is <u>lack of information</u> about:

   - Students' individual learning needs.

   - What learning activities and experiences are matched to diagnosed student needs and established learning objectives and how to help the student engage in such tailored instruction in a timely fashion.

   - When the student has mastered the objectives and is ready to move on.

   - The degree of overall success of staff and programs in promoting student learning, and

   - What one another are doing at each level that is and is not working to help students learn.

3. We are on the verge as a society and a profession of evolving the comprehensive information systems we need to capture and present the information required to have the truly effective and efficient education systems that the model of learning just outlined promises. The main barriers to the development of such information systems are not technical but stem from a lag in a revolution of the will, the wisdom, and the wherewithall to develop and use the tools within our grasp. To make the needed revolution happen, we must first literally turn our educational systems "upside-down" thus unleasing all the energy and power now languishing at the bottom of the present educational hierarchy where teachers and kids live.

The current educational reform movement has been characterized by futurist Alvin Toffler and others as the dying throes of a dinosaur-like system. John Holt has chided us for taking a horse and buggy system, repainting the buggy, paying the driver more, keeping the passengers in it longer and foolishly expecting it to go faster and better. Such criticisms are not surprising since the central emphasis in current reform and efforts on more and higher control of education flies in the face of almost everything we know about human excellence as summarized by such commentators as Peters and Waterman in their book In Search of Excellence where they extol the virtues of decentralized control, ownership, and decision making along with trust and support as the mainstays of excellence in human enterprises.

As I contemplate where we are and where we can be with educational information systems, my best hope is that we will seize the opportunity created by the new generation of distributive, multilevel information systems to apply the principle of subsidiarity to educational systems, leaving to each level all

the control and all the decisions not essential to be handled at a "higher" level. This will put learners back in control of learning and teachers back in control of teaching, but with a feedback loop to the "top" so that it can do its job of adjusting resources and providing other forms of support, including information about overall success and failure.

The next and essential step in the revolution in education I foresee is a structural one in which the walls of the prison of today's education systems "come a-tumbling down." The barriers to be razed include those of place and time. In the long run educational information systems offer to anyone at any time the ability to in effect be tutored by the best tutors in the world in any area they wish to learn, when and where they want to learn it, and to receive credit and certification of their new mastery. When this happens, learning will belong to homes and highways as much as it does to the schools. It will belong to the old as well as to the young.

We are a long way from realizing the hopes and possibilities I have sketched above, but we have made some promising beginnings. For at least two score years, enlightened school system administrators and teachers have been laboring to create, maintain and use comprehensive information systems for both instructional and management purposes. The goal has been to apply the science of data-based decision making born in the turmoil of the second world war to the important task of more effectively and efficiently supporting the magic moment of learning by individual students. The hope that has driven these efforts has been that by collecting, analyzing, reporting and using accurate and appropriate information about students, as well as about classroom, school and district support systems, we could help create

self-renewing and ever better learning communities utilizing the scarce resources at their command as effectively and efficiently as possible.

Up until now these hopes and these possibilities have been largely defeated by a variety of obstacles, including:

- The historic dominance by the "business" functions of educational systems over the resources committed to data-based instructional decision making.

- The shortcomings of extant hardware and software systems.

- The lack of theoretical and causal models of learning and the support of learning to guide us in system and software development.

- But most important of all, the difficulty of enlisting the sustained commitment of overworked school teaching and administrative staff to the difficult task of gathering and maintaining the data for their own purposes much less for reporting "upward" sufficiently accurate data to support decision-making needs at levels further up the educational hierarchy.

Successful educational information subsystems have been developed and used for such instructional applications as computer assisted and managed instruction as well as for administrative monitoring of such things as student background and characteristics, academic performance, attendance and behavior; instructional and support programs; school and district personnel; business and

financial systems, etc. And gradually, through a combination of commitment and technological advances, we have in some cases begun to weld these subsystems together into the beginnings of the comprehensive information systems we have long envisioned and so desperately need. In building such largely "data up"--"decisions down" oriented comprehensive information systems, we have not yet, however, removed the chief obstacle that has impeded us from the beginning, namely the lack of perceived usefulness of the data to the all important data originators. Instead, we have only temporarily dominated it by brute force and resources.

The wedding of a new conceptualization of educational information systems and a new technology which together begin to permit us to turn school information systems and schooling itself topsy-turvey has created a fresh hope for real reform led by effective, efficient and relatively easy-to-maintain, comprehensive classroom, school and school district information systems. The new concept is distributive processing; and the new technology is building and classroom-based networks of micro and miniprocessors linked together and to the system's central processor. In this new paradigm, classroom teachers, school administrators and office staff are not asked to fill out endless and often apparently useless forms with data for the "central administration." Nor are they called upon to capture and hold data for school and classroom decision-making in such clumsy and difficult ways that the seduction of falling back upon intuition and firsthand habitual knowledge is irresistible. Rather, they are helped to utilize classroom and school office computing power to store and analyze data in a way that makes their job of teaching and supporting teaching easier, more effective and more rewarding. Then through careful preplanning, linking and scheduling, the data necessary for program,

policy, evaluation, research and resource allocation decisions "further up the line" are painlessly "skimmed off."

Even the short-range uses to which such emergent comprehensive information systems can be put are great and greatly exciting. They include:

- Targeting instruction on the needs, abilities, readiness and characteristics--including learning style--of individual learners.

- Grouping and placing students so that their learning needs may be met most effectively and efficiently.

- Better and easier classroom, building and district management resulting in better decisions at lower cost freeing time and other resources to be spent on instruction and direct learning support and leadership.

- Prompt, accurate and thorough evaluations of program cost effectiveness.

- Timely and thorough data to support policy formulation and monitoring.

One of the most exciting uses of such comprehensive information systems for those of us in the educational research community, is their potential for fostering more and better applied and basic educational and psychological research. Right now in our district, besides 50 or so major program evaluations and policy analyses, we are driving ten or so major research efforts off our comprehensive test, student and system data base. For example, in collaboration with a university-based researcher, we are now

combing through six years of twice-a-year basic skills achievement measures searching for evidence of curves that describe and predict the pace at which subject learning occurs in relation to developmental indices. We are searching for these predicted patterns for student subgroups by ability, age, ethnic background, sex, etc. The end result will be the ability to diagnose and meet both students' general developmental needs as well as their specific instructional needs in a truly complementary fashion. It is my belief and experience that the data identification and analysis required for dissertation and publication research of average or above quality and extent that once required months or even years can be performed typically in less than a week at one of the ten terminals in my office. This is a tremendous resource which we are only beginning to learn how to use wisely.

I choose not to dwell today on the potential misuses of comprehensive information systems as they emerge. They include, however:

- Invasion of individual and institutional privacy.

- The substitution of "fishing trips" through data for well-thought-out and planned research and policy formulation.

- The evolution of "data junkies" afraid to move ahead without all the data and overly fond of massaging their data bases.

- Overestimation of the accuracy and power of the existing data combined with premature satisfaction with its quality, quantity and appropriateness.

- An inappropriate pushing of the educational pendulum in the direction of its science at the expense of its art, and

- Abuses of the freedom to own and be excellent in the direction of the license to abdicate responsibility to strive to meet even minimum reasonable system expectations.

Much of the need for at once a more decentralized approach to education and a more scientific approach to broad educational decision-making has resulted from a transformation of scale of the educational endeavor. As long as the school was an isolated institution designed as much for the handing down of the values regulating the use of learned skills and concepts in a small, homogeneous community as for the teaching of knowledge and skills themselves, instruction and teaching were by definition personalized and intuition and tradition were satisfactory guides to decisions. But as schools and networks of schools have become increasingly diverse in the larger and broader communities which they serve, and as school districts with free and open access have emerged, the emphasis has increasingly shifted away from inculcating values and toward the efficient and consistent transmittal of skills valuable for the attainment of the increasingly complex social and economic goals of society. The now often conflicting value systems involved, the complex structure of the hierarchical support system, the mounting burden of skills and ideas needed to cope with the complexity of modern life, and the growing costs of education have conspired to make it a truism that if those social and economic goals are to be achieved efficiently, educational systems must be viewed as and must operate as integrated wholes without, however, usurping individual legitimate autonomy as well as initiative and creativity.

Daily decisions in such systems as unified entities must be guided by policy and data rather than by tradition and intuition alone. Moreover, policy must be shaped by a deeper, larger and broader planning of the functioning of the educational system in relation to human, social and economic needs on the one hand and human and financial resources on the other.

Until the present revolution, educational systems have by and large remained the only major areas in our nation's life where decisions about a system which consumes our resources on such a prodigious scale and which is of great personal importance to each of us have continued to be made largely on the basis of tradition, ignorance of the facts, personal bias and benevolent guesswork. It is an ironic fact that, in this fourth decade of the age of scientific management and quantitative decision-making, decisions about the very process in which we supposedly learn to make informed decisions have continued to be made in a largely unstructured and intuitive fashion.

Among the factors supporting the emergence of comprehensive educational information systems dedicated to appropriately supportive scientific decision-making in school systems are: 1) increasingly sophisticated administration and organization, the evolution of highly professional offices of research, evaluation, planning, policy analysis and technology at the national, state and district levels, and 2) the growth of decision-related models and tested educational and learning theories. These factors will not lead to success in data-based decision-making in school systems until we realize that the data upon which higher level decisions are based must be created by the school user primarily to meet his or her own decision-making needs and that all other uses must be secondary.

It is this realization and its implementation through distributive processing and building-based computer technology that has allowed us to begin harnessing the energies present in school buildings and classrooms for making better decisions about student learning and schooling operations at every level in school systems. We are therefore now about to put a new power system in the educational buggy, turn the drivers loose, and ride off in a thousand wonderful directions, all adding up to the satisfaction that comes from achievement of individual goals as well as to a stronger, self-renewing learning society. I, for one, am hugely pleased and excited to be along for the ride.

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